

# Temporary oilfield workers are major factor in increased water use in N. Dakota Bakken region

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A row a tanker trucks transport water from Lake Sakakawea in North Dakota's Bakken region to oil well production sites. The water is injected under high pressure into a wellbore to fracture deep rock formations in order to release the flow of natural gas and petroleum in a process call hydraulic fracturing. Credit: C. E. Clark *et. al.*

Increased water use in the rapidly growing oil industry in North Dakota's Bakken oil shale region, or play, is surprisingly due not only to oil well development but also to people, according to a recent study by the U.S. Department of Energy's (DOE) Argonne National Laboratory.

Increased [oil development](#) in that region in recent years has attracted thousands of oilfield employees. From 2010 to 2012, nearly 24,000 temporary oilfield workers joined the approximately 27,000 permanent residents in Williams County, the seat of the region's commercial [oil](#) industry.

"It is estimated that the average household in the North Dakota Bakken region uses about 80 to 160 gallons of water a day," said Corrie Clark, an environmental systems engineer in Argonne's Environmental Science Division and co-author of a new study published in *Environmental Science & Technology*. "If each new temporary worker used 80 gallons a day, their total would be more than half the water used for [hydraulic fracturing](#) alone. If they used 160 gallons a day, it would exceed the total amount of water used for hydraulic fracturing. Either way, water use by new temporary workers accounts for a big share of the region's increased water use."

The Bakken is a shale oil deposit underlying parts of North Dakota and Montana in the United States, and Saskatchewan and Manitoba in Canada. Annual water use for hydraulic fracturing there has more than quintupled from 770 million gallons in 2008 to 4.27 billion gallons in 2012.

During the same period, the number of new oil wells per year more than quadrupled from 401 to 1,801; however, the increase in the number of wells is not the sole reason for increased water use when it comes to oil development.

In hydraulic fracturing, a pressurized liquid is injected into a wellbore—the actual hole that forms the well—to fracture deep rock formations to release the flow of natural gas and petroleum. Oil development in the Bakken region is dominated by hydraulic fracturing because of the type of rock in which the oil is located.

The study "Water Use and Management in the Bakken Shale Oil Play in North Dakota" also pointed out that the high salinity of the formation requires well operators to inject maintenance water in 10 percent to 15 percent of wells in the North Dakota Bakken to flush out the natural salt build up, Clark said. The use of maintenance water appears to be unique to the Bakken play compared to other plays.

In general, within the Bakken play, maintenance water is used more often the farther west a well is located. It is estimated that, for each well requiring maintenance water, somewhere between 400 and 1,400 gallons is used per day, though limited data are publicly available for this type of water usage.

Meanwhile, wastewater production - both flowback and produced water—is much greater in the Bakken than in other plays, including the Barnett play in Texas, the Denver-Julesberg Basin and the Marcellus play. Furthermore, the amount of waste water produced from a Bakken well in the first year of its life increased from 1.1 million gallons for wells installed in 2008 to 2.9 million gallons for wells installed in 2012.

Most of the water used in the North Dakota Bakken comes from Lake Sakakawea. Recent increases in the lake's water use due to population growth and oil development are not currently an issue in terms of continued availability, Clark said.

Studying the impact of increased oil production activity in the Bakken may help research in analyzing the impact in other oil plays, she said.

"While no other play may have experienced an increase in local population as proportionally large and easy to define as the Bakken, temporary oilfield service populations have an impact everywhere," according to the report. "More data collection and further study in the Bakken and elsewhere are needed to better understand, quantify and minimize [water](#) impacts of unconventional oil and gas development in the future."

**More information:** R. M. Horner et al, Water Use and Management in the Bakken Shale Oil Play in North Dakota, *Environmental Science & Technology* (2016). [DOI: 10.1021/acs.est.5b04079](https://doi.org/10.1021/acs.est.5b04079)

Provided by Argonne National Laboratory

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